Our Dermatology Online

Brief Report

Pilot study: Effect of topical KOH solution for warts treatment

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ABSTRACT

Background: Acrochordons (skin tags) and viral warts are prevalent dermatological conditions with a significant cosmetic and psychosocial impact. Current treatments, including cryotherapy and salicylic acid, vary in efficacy and accessibility. This pilot study investigates the efficacy and safety of patient-applied topical potassium hydroxide (KOH) solutions as a novel, cost-effective treatment alternative for these common lesions. **Materials and Methods:** In this prospective pilot study, nineteen patients with clinically diagnosed common warts, plantar warts, or acrochordons were enrolled. The participants were allocated to apply one of three concentrations (10%, 15%, or 20%) of a formulated KOH gel once daily for seven days, following a five-day pretreatment period with topical salicylic acid solution and initial lesion debridement. The treatment response was evaluated by standardized clinical photography, with outcomes categorized as complete clearance, significant reduction, or no change. **Results:** Among the nineteen patients who completed the protocol, 14 (73.7%) achieved complete clinical clearance of their lesions ($p = 0.031$). Two patients exhibited a significant reduction in lesion size, while two showed no appreciable change. No recurrences were reported at a two-week post-treatment follow-up. **Conclusion:** Topical KOH demonstrates promising efficacy for the treatment of cutaneous warts and acrochordons, with a favorable outcome observed in the majority of patients in this pilot cohort. These preliminary findings warrant further investigation in larger, randomized controlled trials to definitively establish efficacy, optimal concentration, and long-term safety.

Key words: Potassium hydroxide, Warts, Acrochordons, Topical therapy, Pilot study, Salicylic acid

INTRODUCTION

Acrochordons (Fig. 1a) and warts are common dermatological conditions that may cause cosmetic concerns and discomfort for many individuals. Acrochordons are benign cutaneous growths noticeable as soft excrescences of heaped-up skin, caused by skin rubbing in tight areas such as the neck, armpit, and perianal region. Acrochordons are usually benign by nature and almost 50% to 60% of adults will develop at least one of these harmless growths in their lifetime, with the probability of their occurrence increasing after the fourth decade of life, obesity, diabetes mellitus, metabolic syndrome and in people with a family history [1].

There are several treatments of acrochordons, and all require removal of the lesion, be it via the use of a string, cryotherapy and radiocautery; the latter is done most commonly [1]. However, none have tried topical KOH solution.

A wart is a small fleshy bump on the skin or mucous membrane caused by HPV.

HPV is a small, non-enveloped epitheliotropic virus with a circular genome of approximately 8000 bp. HPV infects epithelial cells through skin or mucous membrane micro-abrasions [2]. The virus accesses the basal layer of the epidermis, where it replicates and induces cell proliferation, leading to the formation of warts.

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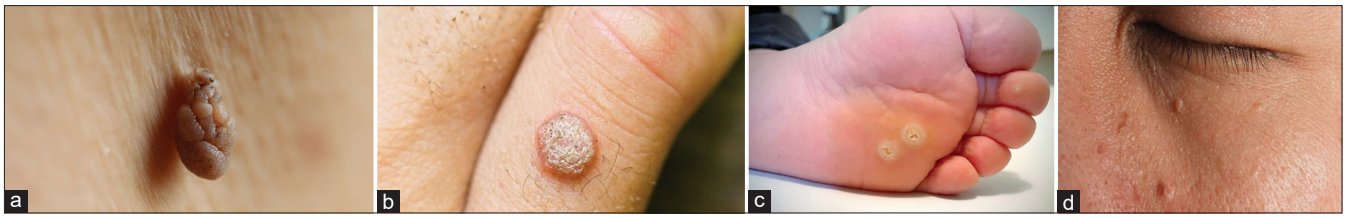

Figure 1: (a) Acrochordon. (b) Common wart. (c) Plantar wart. (d) Flat wart.

According to the WHO, approximately 5% of all cancers worldwide are caused by HPV infections, most of which are related to high-risk HPV types, especially 16 and 18 [2]. HPV is transmitted through direct contact with infected skin or the mucous membranes [2].

Immunocompromised individuals, such as those with HIV/AIDS or organ transplant recipients, are at increased risk of persistent HPV infections, including cutaneous warts, due to impaired cell-mediated immunity [3].

Different types of HPV cause different types of warts, of which, there are five types [4]:

- Common warts (Fig. 1b): usually found on the hands and knees, caused by HPV types 2 and 4 and usually does not cause pain.
- Plantar warts (Fig. 1c): found on the soles of the feet; these are often painful due to pressure when walking.
- Flat warts (Fig. 1d): smaller and smoother, often on the face or legs, caused by HPV types 3, 10, and others.
- Genital warts: Spread through sexual contact, caused by HPV types 6 and 11.
- Periungual warts: Develop around the nails and may affect nail growth.

Traditional treatment for warts has varied in efficacy, isotretinoin gel (61%) [5], topical zinc sulphate solution (86%) [6], oral zinc sulphate (57.5%) [7]. Other explored modalities include topical agents such as formic acid [8] and combination therapies such as intralesional vitamin D3 [9,10] and the measles-mumps-rubella (MMR) vaccine [11], prompting the ongoing need for more effective and accessible alternatives.

Recent studies have explored the potential of topical agents, particularly potassium hydroxide (KOH) in the management of these lesions and found variable but promising success (75–80%) [12]. While other caustic topical agents such as hydrogen peroxide and trichloroacetic acid are also used [10], KOH presents a distinct mechanism of action. Furthermore, compared to procedural interventions such as photodynamic therapy [13], a topical solution offers potential advantages in cost and accessibility. These agents have shown the destruction of abnormal skin growths with few side effects [10]. Yet, none have done so in the treatment of acrochordons or tested higher concentrations such as 20% or used both KOH and salicylic acid. The mechanism of action of KOH is a nucleophilic attack by the OH-anion on the semi-carbon positive atom of the amide of keratin, ester phospholipid of the cell membrane (including the viral one) and the phosphodiester bond of nucleic acids. Also, some articles include the induction of inflammation [14].

The trial presented in this article investigates the effectiveness of using both KOH and salicylic acid in treating acrochordons and warts and seeing if a higher concentration of KOH (20%) is more effective than lower concentrations. By analyzing patient outcomes and treatment responses, this study aims to provide some valuable insights into which topical agent may offer superior results in terms of efficacy and safety. As the demand for non-invasive treatment options increases, understanding the role of these agents becomes essential for both practitioners and patients seeking effective dermatological care.

MATERIALS AND METHODS

Materials used: 1000mL beaker, electric heater, HIMEDIA KOH pellets, Precisa scale (0.0001g), distilled water, SA, and CMC.

First, 1000 mL of distilled water was heated to a temperature range of 70–75°C, after which 4 g of CMC was added gradually, and lastly, a required amount of KOH round flakes was added, also gradually.

A total of 23 patients were recruited for this study; however, only 19 completed it. The four disqualified

participants were excluded due to non-compliance with the provided guidelines. The groups were divided into, FG (7 patients) were given 20% KOH (Figs. 2a – 2j), a sterilized blade and SAS. The SG (7 patients) (Figs. 3a – 3j) and the TG (5 patients) (Figs. 4a – 4j) were given the same, but 15% KOH and 10% KOH solution, respectively.

All groups were instructed to use the SAS once a day for five days, which exfoliates the stratum corneum, exposing the base of the wart/acrochordon. This made the process of removing them easier and facilitated KOH solutions to target the base of the wart/acrochordon rather than just the top.

Then, they used the sterilized blade to remove the wart/acrochordon, after which they applied the KOH solution to the place of the removed wart/acrochordon once a day for seven days.

The patients were asked to take a picture of the wart/acrochordon at the beginning and the end of the

Figure 2: (a) Male patient in the FG with a common wart before the treatment. (b) Same male patient with a common wart after the treatment. (c) Female patient in the FG with a common wart before the treatment. (d) Same female patient with a common wart after the treatment. (e) Male patient in the FG with a common wart before the treatment. (f) Same male patient with a common wart after the treatment. (g) Male patient in the SG with a common wart before the treatment. (h) Same male patient with a common wart after the treatment. (i) Female patient in the FG with a plantar wart before the treatment. (j) Same female patient with a plantar wart after the treatment.

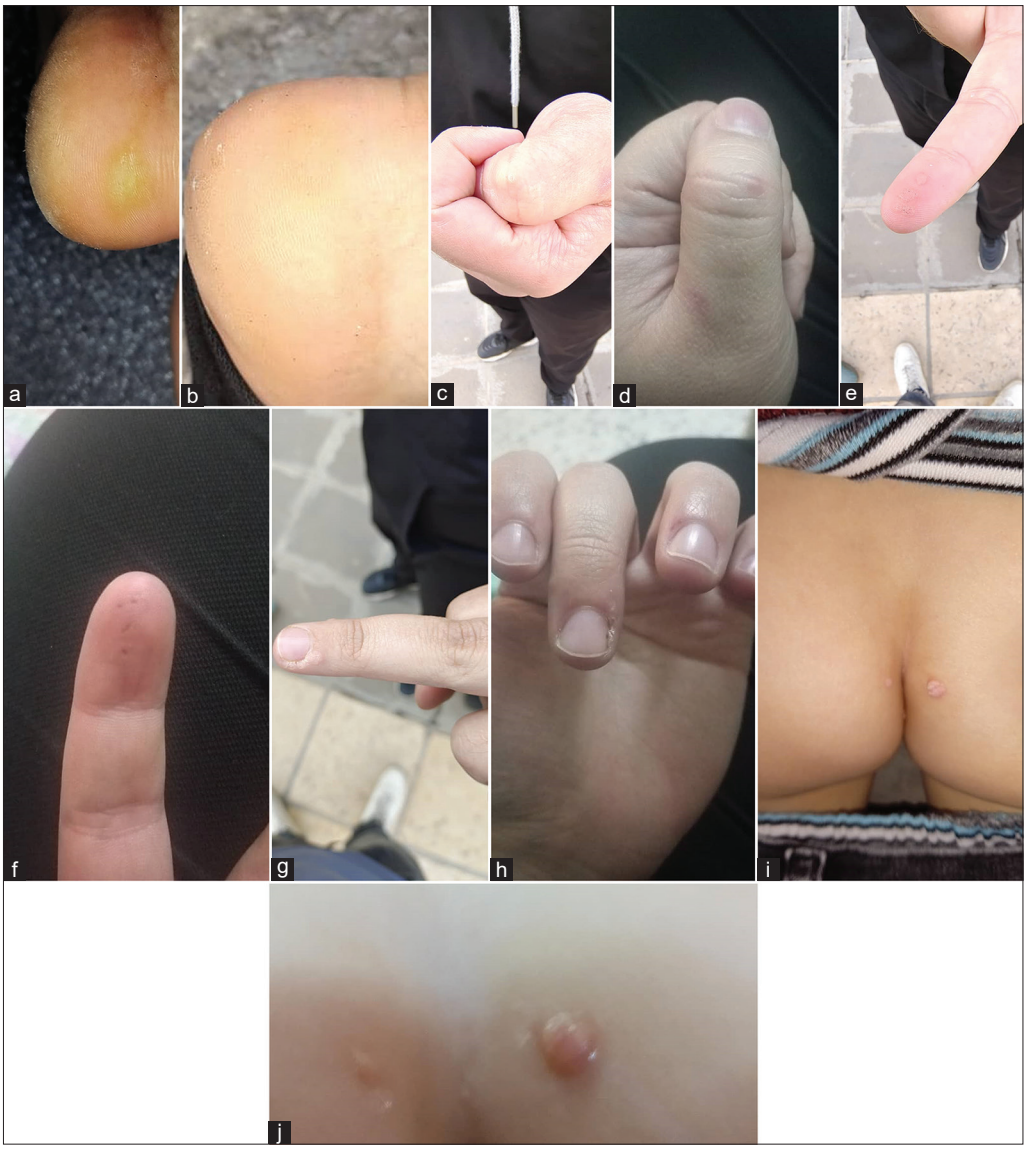

Figure 3: (a) Male patient in the SG with a plantar wart before the treatment. (b) Same male patient with a plantar wart after the treatment. (c) Male patient in the SG with a common wart before the treatment. (d) Same male patient with a common wart after the treatment. (e) Male patient in the SG with a common wart before the treatment. (f) Same male patient with a common wart after the treatment. (g) Male patient in the SG with a periungual wart before the treatment. (h) Same male patient with a periungual wart after the treatment. (i) Male patient in the FG with a common wart before the treatment. (j) Same male patient with a common wart after the treatment.

experiment. Out of the 20, only 14 did, and of those, two did not send an after picture.

The patients' age ranged from 8 to 58. 8 were females and 11 were males.

All solutions were analyzed for pH, active ingredients, viscosity, and microbial contamination at 20°C (Table 1).

ETHICS STATEMENT

This study was conducted in accordance with the Declaration of Helsinki. Due to the exploratory nature and small sample size, formal institutional review board approval was not required according to local regulations. Verbal informed consent was obtained from all participants or from parents/guardians for minors prior to enrollment. All participants provided consent for the use of anonymized clinical photographs for scientific publication.

RESULTS

Five out of 7 in FG and SG saw a complete clearance of their warts. Two out of 5 in TG saw a reduction in size. The rest experienced a complete clearance. No

Figure 4: (a) Female patient in the TG with a common wart before the treatment. (b) Same female patient with a common wart after the treatment. (c) Male patient in the SG with a common wart before the treatment. (d) Same male patient with a common wart after the treatment. (e) Male patient in the TG with an acrochordon before the treatment. (f) Same male patient with an acrochordon after the treatment. (g) Male patient in the TG with an acrochordon before the treatment. (h) Same male patient with an acrochordon after the treatment. (i) Male patient in the TG with a plantar wart before the treatment. (j) Same male patient with a plantar wart after the treatment.

Table 1: Physicochemical and microbiological properties of the prepared topical KOH solutions

Solution	Viscosity (CP)	pH	API (HCL, N2)	Microbial contamination		
				Total aerobic microbial count (C.F.U)	Total yeast & mold count (C.F.U)	Pathogenic test
20% KOH	28.9	14.51	98.5%	4	0	Absent
15% KOH	22.4	14.65	100.3	10	0	Absent
10% KOH	19.01	14.45	104%	3	0	Absent

recurrence was detected after two weeks after the end of the treatment.

DISCUSSION

The observed efficacy rate of 73.7% in this pilot study aligns with the reported range for topical KOH (75–80%) [12] and compares favorably with other patient-applied topical treatments for warts, such as 85% formic acid [8]. It is lower than the high rates reported for some clinician-administered intralesional treatments (e.g., vitamin D3 or MMR vaccine) [8,11], a difference that may be attributable to the inherent variability in patient self-application versus precise injection by a practitioner. This underscores the potential of KOH as an effective option in the topical, self-treatment category.

The percentage of CMC added was good, but it could be raised slightly to increase viscosity since it prevents unwanted side effects of skin irritation.

One patient in the FG, had a prior clinical diagnosis of genital HSV infection, lesions were around 30 scattered from the scrotum to the shaft, reported regression of lesions following a single application of KOH. This incidental observation was not a predefined outcome, was not virologically confirmed, and may have represented spontaneous resolution. Further controlled studies would be required to explore any potential effect.

The patients in Figures 3i and 2g were the two who did not respond to the treatment, while the patient in Figure 4a saw only a reduction in size.

Laboratory findings indicate complete sterility (due to extremely high pH), and thus, there is no need to add a preservative to the solutions.

Future controlled studies with larger sample sizes should directly compare the efficacy, cost, and side-effect profile of topical KOH to other established topical agents (e.g., formic acid [8], hydrogen

peroxide/trichloroacetic acid/5-fluorouracil) [10] and intralesional immunotherapies (e.g., vitamin D3, PPD, and MMR vaccine) [9,11,15]. The role of adjunctive diagnostics, such as dermoscopy to confirm wart morphology prior to treatment [16] could also be explored to improve patient selection and outcomes.

CONCLUSION

This study evaluated the efficacy of a topical KOH solution in the treatment of warts and acrochordons. Among the 19 patients recruited, 14 (73.7%) demonstrated a positive outcome, indicating a favorable response to the treatment. The results suggest that topical KOH is a promising therapeutic option for these common dermatological conditions. However, further studies with larger sample sizes and longer follow-up periods are recommended to validate these findings and assess long-term efficacy and safety. This treatment could offer a simple, cost-effective, and accessible patient-applied solution, providing a valuable addition to the therapeutic arsenal alongside clinician-administered procedures [9,11,13] and other topical agents [8,10].

ABBREVIATIONS

SAS	Salicylic acid solution
FG	First group
SG	Second group
TG	Third group
HPV	Human papillomavirus
CMC	Carboxyl methyl cellulose
HSV	Herpes simplex virus

Statement of Human and Animal Rights

All the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the 2008 revision of the Declaration of Helsinki of 1975.

Statement of Informed Consent

Informed consent for participation in this study was obtained from all patients.

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